

REMARKS

In the present Amendment, Claim 1 has been amended to recite “the superficial velocity of the gas is 3.0 to 10 cm/sec.” Section 112 support for this amendment may be found, for example, at page 3, line 27 of the specification. New Claim 4 has been added. Section 112 support for the new claim may be found, for example, at page 3, lines 7-8 and Examples of the specification. No new matter has been added, and entry of the Amendment is respectfully requested.

Upon entry of the Amendment, Claims 1-4 will be pending.

At page 2 of the Action, Claims 1-3 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Codignola (US 3,127,452).

Applicants submit that this rejection should be withdrawn because Codignola does not disclose or render obvious the presently claimed process for hydrogenating an olefin.

Applicants submit that in the presently claimed process for hydrogenating an olefin, a liquid containing an olefin and a gas containing hydrogen can be uniformly flowed in the packed bed without localization by passing upwardly (upflow) the liquid through a packed bed of a solid hydrogenation catalyst. See, page 3, lines 9-15 of the specification. In addition, decrease of the reaction rate of hydrogenation can be avoided by controlling the superficial velocity of the gas to 3.0 cm/sec or more. In contrast, increase of pressure loss can be prevented by controlling the superficial velocity of the gas to 10 cm/sec or less. See, the paragraph bridging pages 3 and 4 of the specification.

The superior effect of the presently claimed superficial velocity of the gas on the reaction rate per unit catalyst is also evidenced by Examples of the specification as shown below.

When the superficial velocity of the gas was 7 cm/sec and 6.5 cm/sec within the claimed range, the reaction amount of α -methyl styrene was 49 kmol/m³ catalyst/hr and 71 kmol/m³ catalyst/hr, respectively, as shown in Examples 1 and 2. On the other hand, when the superficial velocity of the gas was 2.7 cm/sec and 2.8 cm/sec, i.e., outside the claimed range, the reaction amount of α -methyl styrene was 14 kmol/m³ catalyst/hr and 42 kmol/m³ catalyst/hr, respectively, as shown in Comparative Examples 1 and 2. These results cannot be expected from Codignola as discussed below.

Codignola discloses a process of hydrogenating α -methyl styrene comprising passing a liquid containing an olefin and a gas containing hydrogen upwardly through a packed bed of a solid hydrogenation catalyst (Example 1). Codignola is silent with regard to the range of the superficial velocity of the gas. Applicants have determined the superficial velocity of the gas in Codignola from the reaction conditions described in Example 1 (1), (2) and (3) of Codignola as follows:

Cross-sectional area of reactor = $(26/2 \times 10^{-3})^2 \times \pi = 0.00053 \text{ m}^2$ (see, col. 2, lines 10-11
“a bore of about 26 mm”)

Example 1:

(1) 10 normal liters hydrogen, 92 °C, atmospheric pressure (see, col. 2, lines 32-35)

(Here, the velocity of hydrogen supplied is interpreted as 10 normal liters (NL) /hour (h).)

$$10 \text{ NL/h} = 10 \times 10^{-3} \text{ Nm}^3/\text{h} = 0.01 \text{ Nm}^3/\text{h}$$

$$\text{Superficial velocity} = (0.01 \text{ m}^3/0.00053 \text{ m}^2)/(3600 \text{ sec}) \times (273+92)/273 \times 100 = \underline{\underline{0.7}}$$

cm/sec

(2) 7.8 normal liters hydrogen, 95 °C, atmospheric pressure (see, col. 2, lines 35-38)

$$\text{Superficial velocity} = (7.8 \times 10^{-3}/0.00053)/3600 \times (273+95)/273 \times 100 = \underline{\underline{0.55 \text{ cm/sec}}}$$

(3) 6.7 normal liters hydrogen, 96.5 °C, atmospheric pressure (see, col. 2, lines 39-42)

Superficial velocity = $(6.7 \times 10^{-3} / 0.00053) / 3600 \times (273 + 96.5) / 273 \times 100 = \underline{\underline{0.48 \text{ cm/sec}}}$

From the above calculations, it is apparent that the superficial velocity in Example 1 (0.48-0.7 cm/sec) of Codignola is much lower than that specified in the present claims (3.0-10 cm/sec).

Accordingly, Codignola does not disclose or suggest the superficial velocity range specified in the present claims.

Further, Applicants submit that it is difficult and it is not obvious to one ordinary skilled in the art to determine the optimum conditions based on Codignola since Codignola discloses a range much lower than that in the present claims as discussed above.

In view of the above, reconsideration and withdrawal of the § 103(a) rejection based on Codignola '452 are respectfully requested.

Applicants submit that new Claim 4 is believed to be allowable for the same reasons that Claims 1-3 are allowable.

Allowance is respectfully requested. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.


Respectfully submitted,

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